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FINAL REPORT
DECEMBER 1991

REPORT NO. 91-10

40MM AMMUNITION
PA120 CONTAINER
PALLET RAIL IMPACT TEST

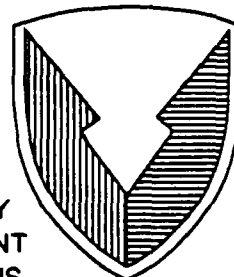
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REPORT NO. EVT 91-10

40MM AMMUNITION PA120 CONTAINER PALLET RAIL IMPACT TEST

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PART 1

INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SMCAC-DEV), was tasked by USADACS, Supply Engineering Division (SMCAC-DES), to test a pallet for PA120 containers of 40mm ammunition.

B. AUTHORITY. This test was conducted IAW mission responsibilities delegated by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL.

C. OBJECTIVE. The objective of this test was to assess the ability of the pallet to sustain rough handling and contain a load during a transportation cycle.

D. CONCLUSION. The pallet, as a nonproduction item, passed rail impact testing. The damage to the PA120 containers was not cause for failure since the containers performed as they did prior to the test. However, the strength of the top lift assembly must be increased before production (see recommendations) and the production first article must be tested to show no damage.

E. RECOMMENDATIONS:

1. Increase the clearance for the lifting hooks to allow easier use of the four-legged sling.
2. Correct the problem of buckling by increasing the gage of steel, or, otherwise, increasing the strength in critical areas.

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PART 2

12 MARCH 1991

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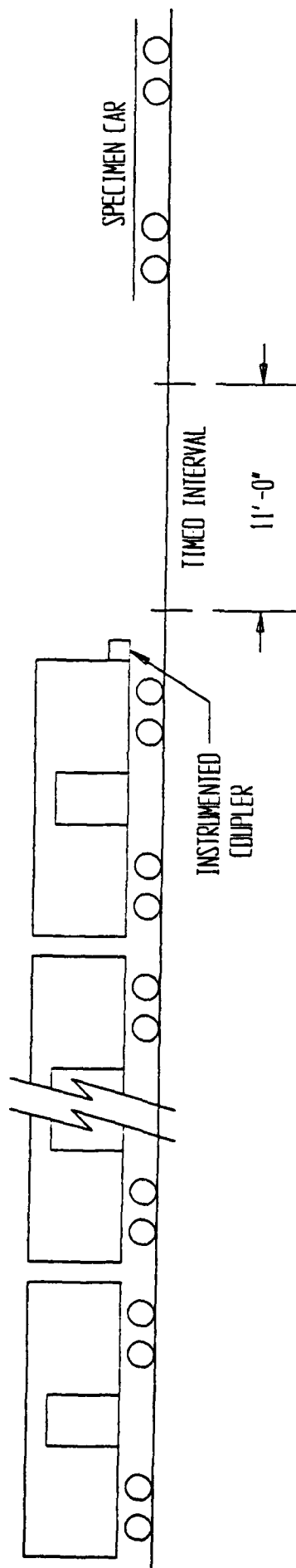
PART 3

TEST PROCEDURES

TRANSPORTABILITY TESTS. The test procedures outlined in this section were extracted from EVT-TP-91-01, July 1991. This standard identifies six steps that a load must undergo if it is considered to be acceptable. The test that was conducted on the test specimen is synopsized below.

RAIL IMPACT TEST. The test load or vehicle was positioned in/on a railcar. For containers, the loaded container was positioned on a container chassis and securely locked in place using the twist locks at each corner. The container chassis was secured to a railcar. Equipment needed to perform the test included the specimen (hammer) car, five empty railroad cars connected together to serve as the anvil, and a railroad locomotive. These anvil cars were positioned on a level section of track with air and hand brakes set and with the draft gears compressed. The locomotive unit pulled the specimen car several hundred yards away from the anvil cars and, then, pushed the specimen car toward the anvil at a predetermined speed, then disconnected from the specimen car approximately 50 yards away from the anvil cars which allowed the specimen car to roll freely along the track until it struck the anvil. This constituted an impact. Impacting was accomplished at speeds of 4, 6, and 8 mph in one direction and at a speed of 8 mph in the opposite direction. The 4 and 6 mph impact speeds were approximate; the 8 mph speed was a minimum. Impact speeds were determined by using an electronic counter to measure the time required for the specimen car to traverse an 11-foot distance immediately prior to contact with the anvil cars (see figure 1).

ASSOCIATION OF AMERICAN RAILROADS (AAR) STANDARD TEST PLAN



5 BUFFER CARS (ANVIL) WITH DRAFT GEAR
COMPRESSED AND AIR BRAKES IN A SET
POSITION

ANVIL CAR TOTAL WT 250,000 LBS (APPROX)

SPECIMEN CAR
IS RELEASED BY
SWITCH ENGINE TO

ATTAIN: IMPACT NO. 1 @ 4 MPH
IMPACT NO. 2 @ 6 MPH
IMPACT NO. 3 @ 8 MPH

THEN THE CAR IS REVERSED AND
RELEASED BY SWITCH ENGINE TO

ATTAIN: IMPACT NO 4. @ 8 MPH

FIGURE 1

PART 4

TEST EQUIPMENT

A. TEST LOAD.

- | | |
|-----------------|--|
| 1. Description: | Six pallets containing 40mm ammunition
PA120 containers in the specimen car
filled with ballast pallets (see drawing). |
| 2. Unitization: | 2-high by 3-wide by 7-long |

B. TEST SPECIMEN.

- | | |
|--------------------|---------------------------------|
| 1. Description: | Boxcar |
| 2. Specifications: | |
| | LD LMT: 156,200 pounds |
| | LT WT: 63,800 pounds |
| | Internal height: 11.00 feet |
| | Internal width: 9.50 feet |
| | Internal length: 50.50 feet |
| | Internal cube: 5,277 cubic feet |

PART 5

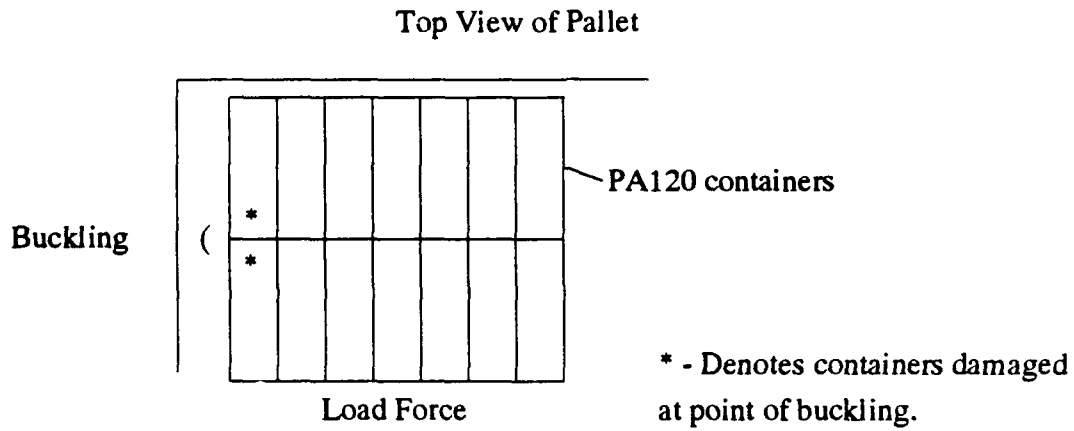
TEST RESULTS

A. TRANSPORTABILITY TEST. Rail impact test was done at a nominal 4, 6, and 8 mph and 8 mph in reverse. The exact speeds are shown below.

IMPACT (No.)	SPEED (MPH)
1	4.44
2	6.40
3	8.48
4	8.33 reverse

The first impact caused no damage to any of the pallets. However, the 6 mph impact caused buckling in the top lift assembly of the top layer load bearing pallet. During the 8 mph impact, the buckling increased on the top layer load bearing pallet and the top layer pallet at the center of the boxcar began to buckle. The 8 mph reverse impact caused buckling in the opposite end top lift assembly of the top pallet and increased the buckling of the top pallet at the center of the boxcar (see photos).

Upon disassembly, only two PA120 containers showed any damage. The damage consisted of buckling of approximately 1/16-inch on the interlocks on the containers on the top layer of one of the end top pallets next to the buckling on the top lift assembly (see next page). The damage, however, did not affect the performance of the containers.



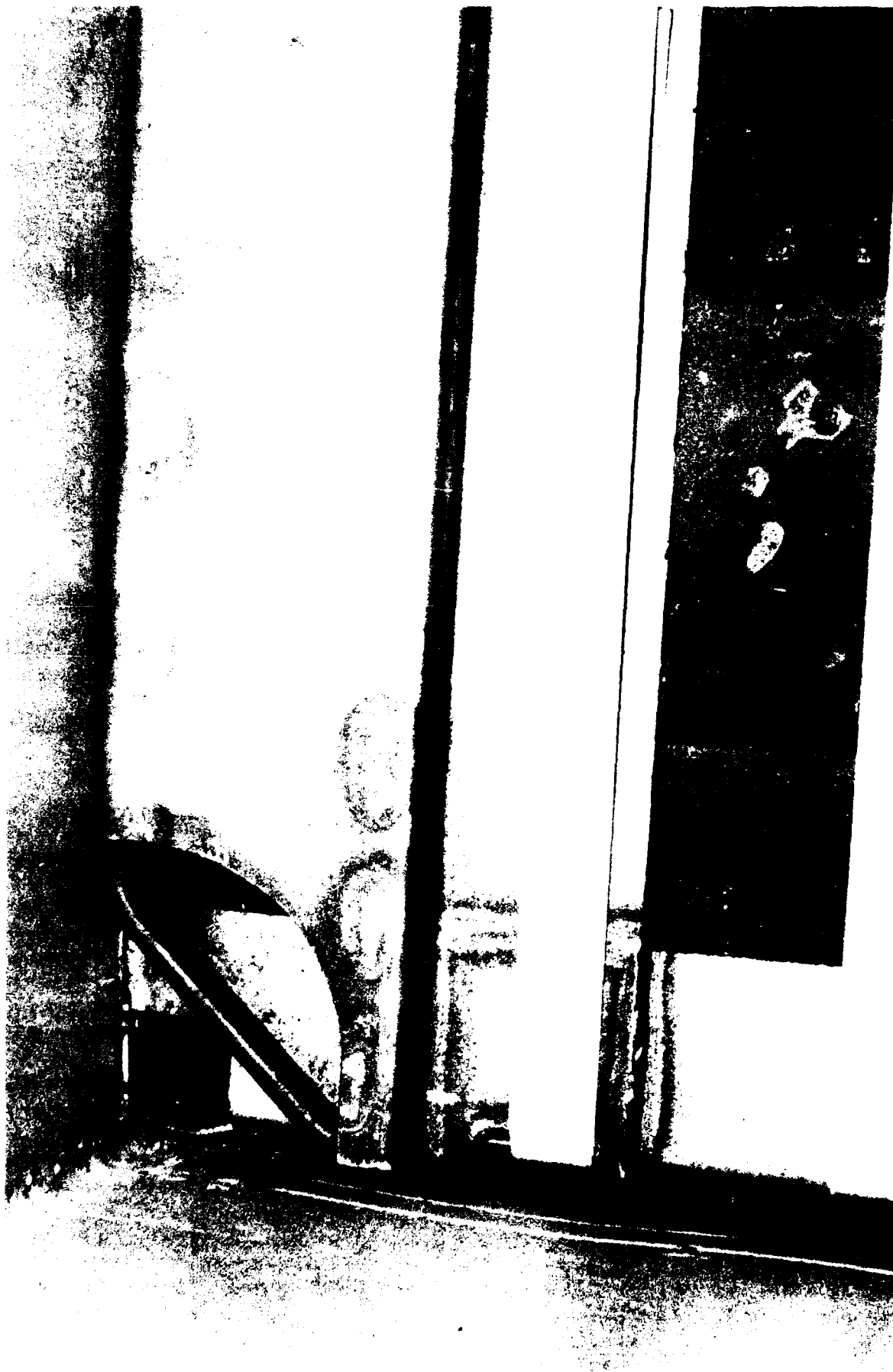
B. LIFTING/SLINGING TEST. Some interference occurred when using the four-legged sling, due to a lack of clearance for the sling lifting hooks around the top lift assembly lift points. No other deficiencies were noted.

PART 6

PHOTOGRAPHS

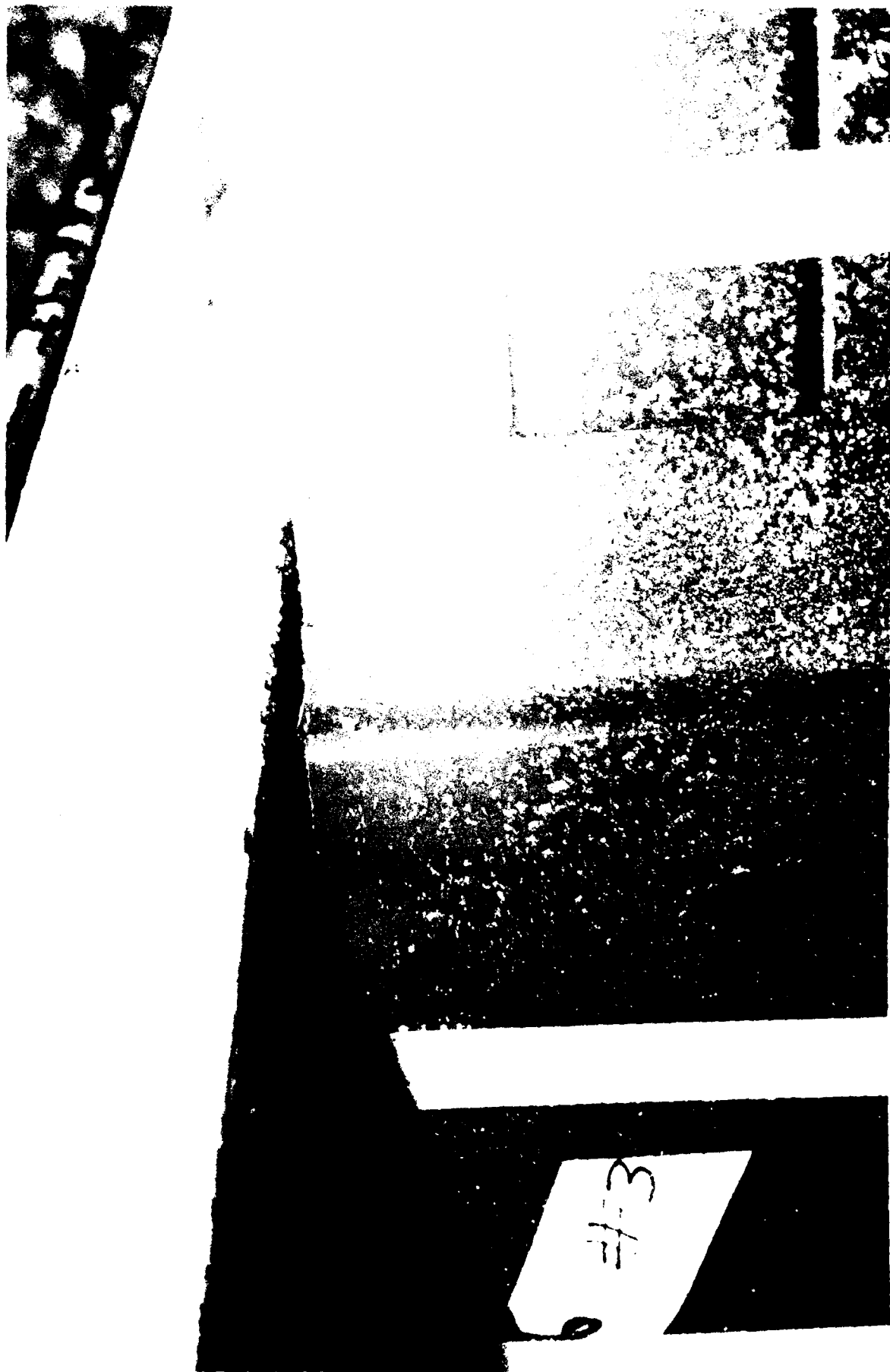


	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
Photo No. AO317-SPN-91-128-1895. This photo shows damage to the pallet at the impact end top of the boxcar following testing.		



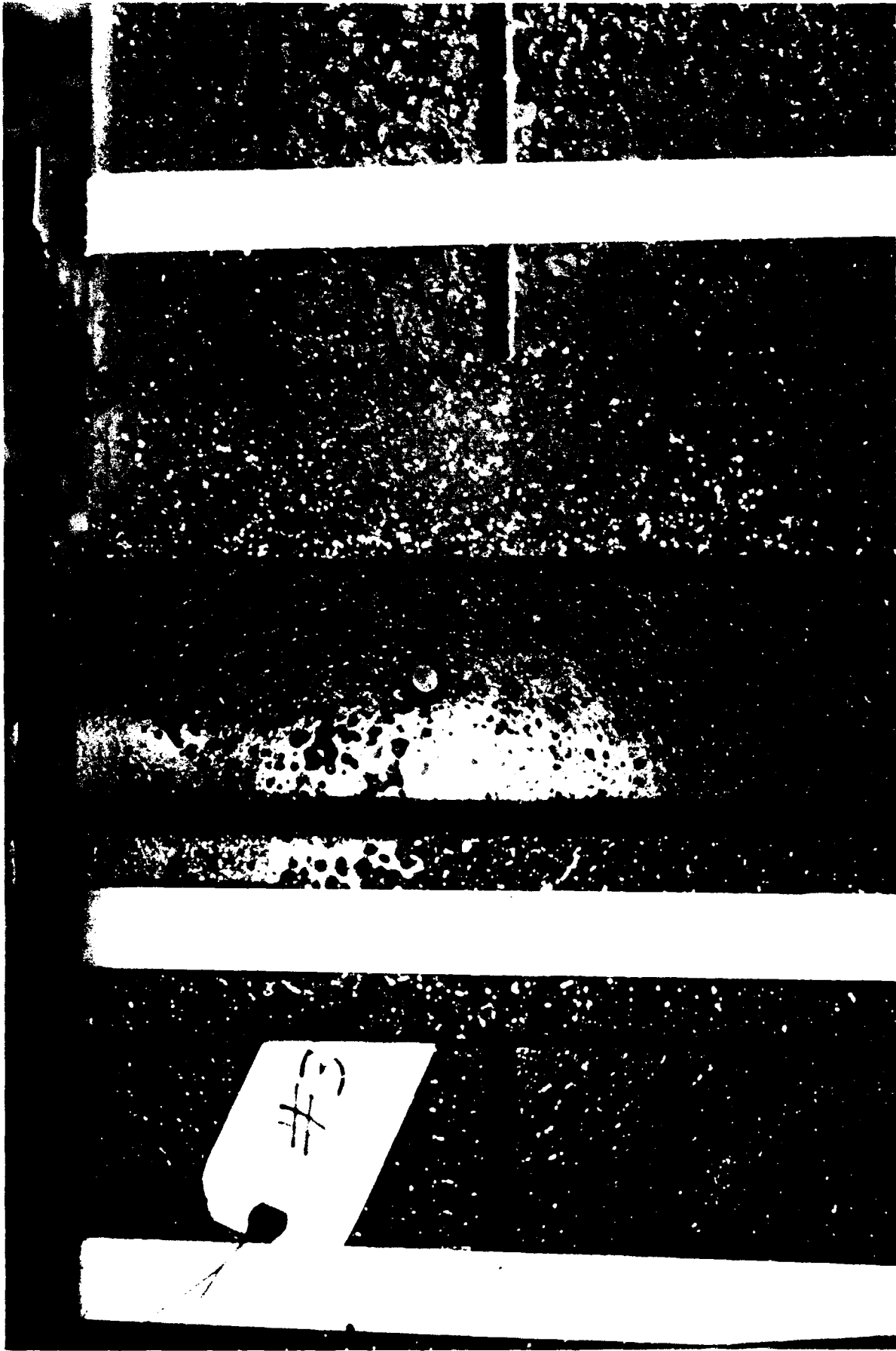
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Photo No. AO317-SPN-91-173-1893. This photo shows damage to the pallet at the opposite end top of the boxcar following testing.



U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. AO317-SPN-91-128-1897. This photo shows damage to the pallet at the center top of the boxcar after the first 8 mph impact.

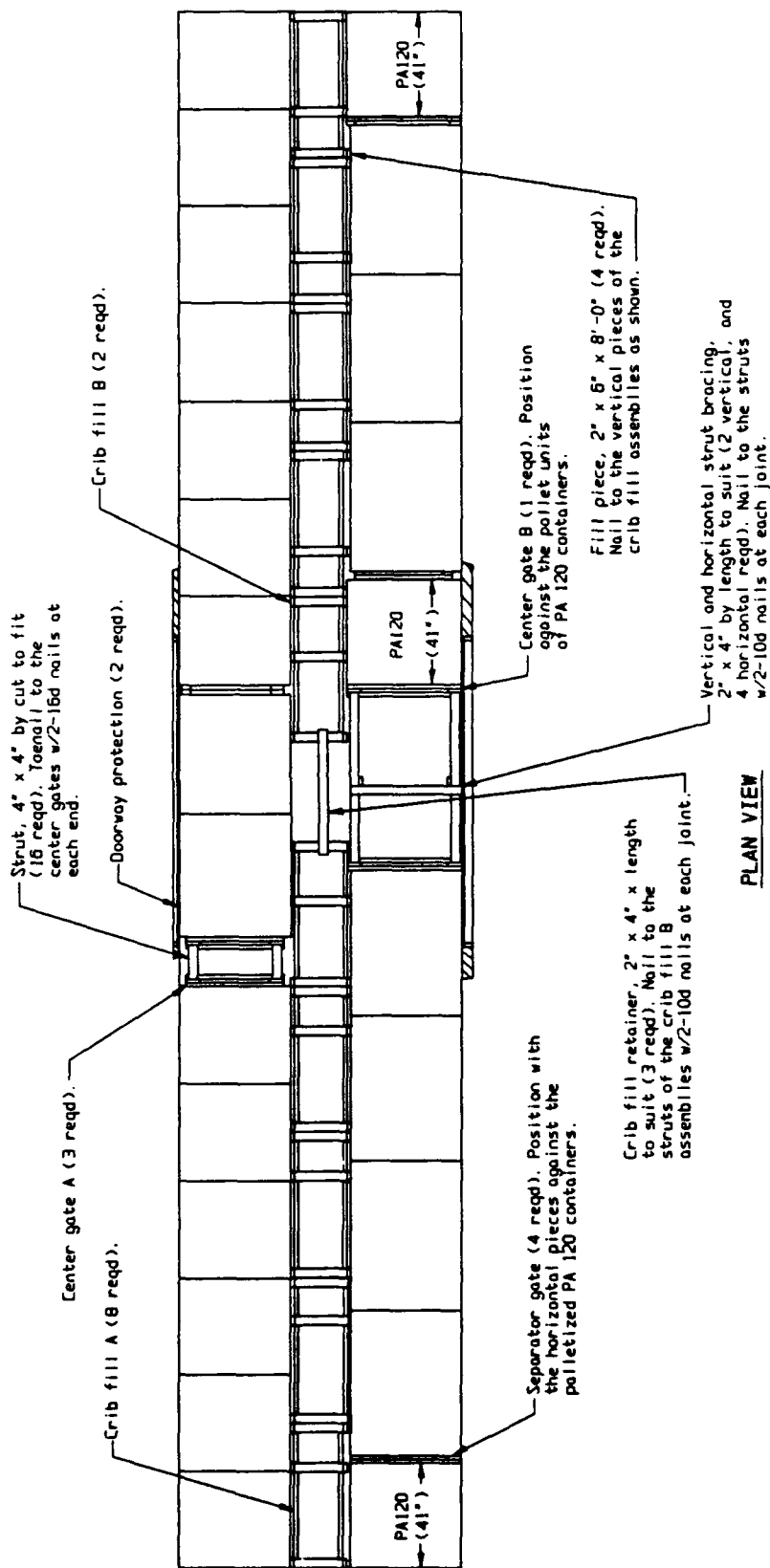


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Photo No. AO317-SPN-91-128-1896. This photo shows damage to the pallet after the reverse 8 mph impact.

PART 7

DRAWING



PLAN VIEW

LOAD AS SHOWN

Item	Quantity	Weight (approx)
PA120 pallet unit	6	15,000 lbs
ballast pallet unit	51	81,300 lbs
Dunnage		2,379 lbs
Total weight		98,679 lbs (approx)